

February 23, 2006

MEMORANDUM

TO: Charles W. Ariss, P.E., Regional Engineering Manager

FROM: Paul Wakagawa, P.E., Technical Engineer 1

SUBJECT: **Staff Analysis of the Sorrento Lactalis Application for Permit Renewal
LA-000091-02 (Industrial Wastewater)**

1.0 PURPOSE

The purpose of this memorandum is to satisfy the requirements of IDAPA 58.01.17.400 for issuing wastewater reuse permits.

2.0 PROCESS DESCRIPTION

The Sorrento Lactalis cheese production facility is located east of Nampa at the northeast corner of the intersection of Franklin Road and Star Road. The facility currently processes around 3.2 million pounds of milk per day and produces over 300,000 pounds of Mozzarella cheese per day.

In 2005, Sorrento Lactalis constructed a new wastewater treatment plant (WWTP) with effluent discharge to the Purdam Gulch Drain, tributary to the Boise River. The major components of the plant are parallel sequencing batch reactors (SBR) for biological treatment, parallel dual sand filters, and sludge handling facilities. Polymers and chemicals are used to enhance treatment efficiency. The plant effluent is ultimately required to meet a total phosphorus limit of 0.07 mg/l.

The flow rate to the treatment plant is typically 300,000 to 500,000 gallons per day (gpd). The WWTP is designed for a maximum daily flow rate of 775,000 gpd. Sorrento Lactalis submitted a renewal application for permit LA-000091 to retain the option to land apply wastewater at the plant site under certain circumstances, such as plant upsets, power failures, or if the WWTP is out of compliance with NPDES permit requirements.

3.0 SUMMARY OF EVENTS

The facility was operated by Swiss Village Cheese until 1991. In 1991, Simplot Dairy Products purchased the facility and operated the plant until 1999. Sorrento Lactalis, Inc. has operated the plant since early 1999.

Land application of wastewater generated in the cheese making process began around 1973 on fields around the plant. In 1990, 80 acres was added to the land application site and the total area was about 125 acres. High organic, salt, and nutrient loading rates on the fields around the plant resulted in ground water impacts and nuisance complaints. The original WLAP permit was issued on July 26, 1995 and expired on August 1, 2000.

In 1999, Sorrento Lactalis began off-site land application at various farms at “de-minimis” rates, as prescribed in the WLAP permit, to reduce loading rates at the plant site. Difficulty in managing these off-site areas resulted in the formation of a new land application site located near Murphy, Idaho. The permit

(LA-000191-01) was issued to a separate business entity, Food-Byproducts Management, LLC (FBM) in 2002. Sorrento Lactalis contracted with FBM to handle the majority of the wastewater generated at the plant. A small portion of the wastewater generated continued to be land applied at the plant site fields through 2005.

On a parallel path to land application at the FBM site, Sorrento Lactalis began investigating the feasibility of constructing a WWTP. In December 2002, Sorrento Lactalis applied for an Environmental Protection Agency (EPA) NPDES permit to discharge treated water to the Purdam Gulch Drain, tributary to Mason Creek and the Boise River.

Construction plans for the new WWTP were submitted to DEQ in the fall of 2004. EPA issued NPDES permit ID-002803-7, effective November 2005. Startup of the new WWTP began in October 2005 and discharge to the Purdam Gulch Drain began on December 16, 2005. Wastewater solids (biosolids and other sludges) generated in the treatment process continues to be delivered to the FBM site for land application. This sludge stream is typically 3 to 5% solids.

In the event that the WWTP has upset conditions or does not meet the discharge limits specified in the NPDES permit, Sorrento Lactalis requested the ability to continue land application of wastewater at the plant site. An application to renew the plant site permit (LA-000091) was submitted by McMahon Associates, Inc. in June 2005. DEQ provided comments on the application on July 25, 2005. McMahon Associates submitted a response to DEQ comments in September 2005.

The application requested approval for land application of the following streams at the plant site under the following conditions:

1. High strength wastewater that is unable to feed directly to the WWTP. The first alternative is to truck out the wastewater to an approved land application site, second alternative is to store the high strength waste in T-200 and gradually feed the stream into the WWTP, and the third alternative is land application at the plant site.
2. If the SBR effluent is not in compliance with the sand filter feed criteria, it will be treated in sand filter feed tank T400 prior to discharge to the sand filters. If that is not successful, the off-grade SBR effluent would be sent to the plant site land application fields.
3. If final effluent to the Purdam Gulch Drain is out of compliance with NPDES permit requirements, it may be diverted to the plant site land application fields.
4. In the event of power failure, raw wastewater can be pumped with P-900 to the plant site land application fields.

Issues that remained unresolved in the renewal application review are:

1. Continuation of land application of high strength wastewater under emergency conditions at the plant site;
2. Storage of high strength wastewater in un-lined ponds at the plant site; and
3. Odor and nuisance management during land application and/or storage of high strength wastewater at the plant site.

These issues are discussed in this staff analysis.

4.0 DISCUSSION

4.1 General Information

The general location of Sorrento Lactalis plant and land application area is shown in [Figure 2](#). Details of the land application system are shown in [Figure 3](#), *Field Identification and Monitor Well Locations*. The application proposes permitting seven fields consisting of 133.1 acres. The site has nine (9) ground water monitoring wells. Ground water flow direction is to the west northwest. The land application area is under a 20-year lease from the J. R. Simplot Company. The lease expires March 13, 2019.

4.2 Wastewater

Prior to the construction and startup of the new WWTP, untreated raw wastewater from the plant was land applied at various locations. The historical wastewater generation rates and location where the wastewater was land applied is shown in Table 1.

Table 1. Wastewater Generated at Sorrento Lactalis

Year	Process Wastewater Generated, MG	Applied at Plant Site (LA-000091-01)	Applied at Deminimis Sites	Applied at FBM (LA-000191-01)
1999	122.6	122.6	0	0
2000	113.5	33.4	80.1	0
2001	133.8	25.7	108.1	0
2002	172.3	30.7	85.6	56.0
2003	189.8	39.0	0	150.8
2004	199.1	45.8	0	153.3
2005	159.0	45.3	0	113.7

4.2.1 Wastewater Quality

The wastewater type, characteristics, and estimated volume that may require disposal by land application post-WWTP operation are shown in Table 2. This information is taken from Table #2 of the Permit Renewal Application¹ prepared by McMahon Associates (McMahon 2005).

Table 2.

Parameter\Wastewater Type	Untreated Raw Wastewater	Plant Spill	Solids Loss from SBR	Non-Compliant Effluent
Chemical Oxygen Demand	4,000 mg/l	10,000 mg/l	100 mg/l	20 mg/l
Total Nitrogen	101 mg/l	250 mg/l	40 mg/l	10 mg/l
Total Phosphorus	50 mg/l	125 mg/l	2 mg/l	1 mg/l
Non-Volatile Dissolved Solids	1,819 mg/l	2,000 mg/l	1,500 mg/l	1,500 mg/l
Estimated Volume to Land Application, gallons per year	See note 1	350,000	3,500,000	3,500,000

Notes: During a power outage, cheese making and wash-up stops, therefore wastewater flow during a power outage is equal to the volume of flow in the drains before an outage occurs, or a few thousand gallons.

¹ Application for Wastewater Land Application Permit, McMahon Associates, Inc., April 4, 2005 (McMahon 2005)

4.2.2 Wastewater Loading Rates

The constituent loading rates using the Table 2 wastewater volume and quality and a land application area of 133 acres are shown in shown in Table 3. The volume of untreated raw wastewater was assumed to be 10,000 gallons per year.

Table 3. Loading Rates

Parameter	Loading Rate	Typical Permit Loading Rate
Nitrogen, pounds per acre-year	17	150% of crop uptake
Chemical Oxygen Demand, pounds per acre-day	0.7	50
Non-Volatile Dissolved Solids, pounds per acre-year	703	Not limited unless TDS significantly impacts ground water quality
Phosphorus, pounds per acre-year	3	Not limited unless land application operations result in phosphorus discharge to surface water

The Table 3 loading rates are below DEQ guideline loading rates for nitrogen and COD. NVDS and phosphorus loading rates are below levels of typical crop uptake for those constituents.

The Sorrento Lactalis facility is located in a watershed that is tributary to the Boise River. The Boise River is water quality limited based on nutrients and plans to reduce the phosphorus load to the river are currently being evaluated.

Due to historical loading rates at the Sorrento Lactalis plant site, the soils have high phosphorus levels which could enter into the shallow ground water and discharge to surface water. The high level of phosphorus in the soil also raises concerns for the potential to have sediment runoff into drains and canals that are present near this site. Table 4 shows the phosphorus soil results for 2003 to 2005.

Table 4. Soil Phosphorus, 2003 to 2005

Soil Sample Location	Plant Available Phosphorus, mg/kg		
	2003	2004	2005
SU-009102, 0-12 inches	121	111	65
SU-009102, 12-24 inches	136	114	45
SU-009102, 24-36 inches	79	74	36
SU-009103, 0-12 inches	60	147	38
SU-009103, 12-24 inches	48	120	28
SU-009103, 24-36 inches	25	142	18

The DEQ *Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater*² (Guidance), section 4.8, discusses limiting phosphorus loading rates in certain situations. The Guidance states if a

2 DEQ *Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater* (Guidance) can be found on the DEQ website at http://www.deq.state.id.us/water/permits_forms/permitting/guidance.cfm

facility has a ground water interconnection to surface water and the soil phosphorus levels are above 20 ppm (Olsen method) in the 24 to 36" soil layer, phosphorus limits are recommended. The soil phosphorus in SU-009102 has been above 20 ppm in the 24 to 36" layer the last three years.

The phosphorus level in SU-009103 in the 24 to 36" layer was 142 ppm in 2004 and was only 18 ppm in 2005. However, the phosphorus loading rate in 2005 was 78 pounds per acre which is above typical crop uptake. From annual report data, the reason for the sharp decrease in phosphorus in this soil unit is not apparent.

If there is a ground water interconnection to surface water, the Guidance states ground water phosphorus concentration downgradient of a land application should be 0.1 mg/l or less and if upgradient ground water is higher than 0.1 mg/l phosphorus, no increase should occur at downgradient compliance wells.

This site has shallow ground water that discharges to nearby drains and canals. The results of ground water monitoring done for phosphorus in 1999 are shown in Table 5. No other data is currently available. The location of the monitoring wells is shown in Figure 3.

Table 5. Ground Water Phosphorus, Sample Date April 25, 1999

Monitoring Well	Phosphorus, mg/l	General Location
MW-1	0.14	Downgradient
MW-2	0.12	On-site, SU-009102
MW-3	0.26	Upgradient
MW-4	1.34	On-site, SU-009103
MW-5	0.40	Upgradient
MW-6	0.30	Upgradient
MW-7	0.21	Downgradient
MW-8	0.20	Downgradient
MW-9	0.36	Downgradient

Based on the soil and ground water phosphorus levels and concerns with phosphorus in this watershed, staff recommends conservative phosphorus loading rates in the future permit. Phosphorus application rates at crop uptake or less will be specified in the draft permit. Ground water monitoring for phosphorus is also recommended.

Ground water TDS (Total Dissolved Solids) values are shown in Table 6.

Table 6. Ground Water TDS, Sample Date October 6, 2005

Monitoring Well	TDS, mg/L	General Location
MW-1	825	Downgradient
MW-2	2,440	On-site, SU-009102
MW-3	430	Upgradient
MW-4	1,100	On-site, SU-009103
MW-5	490	Upgradient
MW-6	320	Upgradient
MW-7	658	Downgradient
MW-8	1,260	Downgradient
MW-9	850	Downgradient

The ground water quality standard for TDS is 500 mg/l. The ground water TDS levels indicate significant TDS impacts have occurred at this site.

McMahon 2005, Table #4 requests a hydraulic application allowance of up to 90.5 million gallons per year and up to 25.5 million gallons during the non-growing season. Attachments 1 and 2 summarize the projected loading rates for two scenarios. The first scenario represents the application of 7.36 million gallons per year as shown in Table 2 of this staff analysis. The second scenario represents application of approximately 90.5 million gallons per year as requested in McMahon 2005. Table 7 summarizes the loading rates for these two scenarios.

Table 7. Loading Rates at 7.36 and 90.36 MG/year

Parameter	7.36 MG/year of Wastewater Applied	90.36 MG/year of Wastewater Applied
Nitrogen, pounds per acre-year	17	147
Chemical Oxygen Demand, pounds per acre-day	0.7	1.54
Non-Volatile Dissolved Solids, pounds per acre-year	703	8,510
Phosphorus, pounds per acre-year	3	11

Staff recommends more limited application rates than requested in McMahon 2005 based on existing environmental concerns. Conservative TDS loading rates commensurate with crop uptake are recommended to prevent further contribution of TDS to the ground water.

Crop ash removal is used to approximate TDS removal by the crop (Guidance, page 7-63). The annual reports for the years 2002 through 2005 reported an average crop ash removal of 1,378 pounds per acre at the Sorrento Lactalis plant site. Staff recommends setting the loading rate limit for Non-volatile Dissolved Solids (NVDS) at the crop ash removal amount in the renewal permit. This will be the limiting constituent under foreseeable scenarios. This limit is designed to prevent future contributions of TDS to ground water which has been significantly impacted by past land application practices. See Table 6.

Allowing land application of the wastewater streams as shown in Attachment 3, including non-compliant final effluent for 20 days per year at a flow rate of 0.5 mgd, is shown in Table 8. This scenario results in an NVDS application rate approximately equal to crop uptake based on historical ash removal.

Table 8. Loading Rates at 13.86 MG/year

Parameter	13.86 MG of Wastewater Applied
Nitrogen, pounds per acre-year	21
Chemical Oxygen Demand, pounds per acre-day	0.7
Non-Volatile Dissolved Solids, pounds per acre-year	1,315
Phosphorus, pounds per acre-year	4

The proposed NVDS loading rate limit will result in low phosphorus loading rates, less than typical crop

uptake, and should result in declining soil phosphorus values over time.

4.2.3 Growing Season (GS) Hydraulic Requirements for Crop Need

The GS hydraulic loading rate limit is determined by the irrigation water requirement (IWR) for the crop grown based on the following formula:

$$IWR = [Cu - (PPT_e + \text{carry over soil moisture}) + LR]/E_i.$$

where: IWR is the irrigation water requirement or the hydraulic loading rate for the growing season

Cu is the crop consumptive use

PPT_e is the effective precipitation

LR is the leaching rate

E_i is the irrigation system efficiency

Using crop irrigation requirements from *Estimating Consumptive Irrigation Requirements for Crops in Idaho*, 1983 by R.G. Allen and C.E. Brockway, and an irrigation efficiency of 70% for furrow irrigation, the IWR for alfalfa and pasture grass is shown in Table 9.

Table 9. Irrigation Water Requirement

Crop Type	IR ¹ (inches)	E _i (%)	IWR (inches)
Alfalfa	36.85	70	52.64
Pasture	36.65	70	52.36

1. The Irrigation Requirement (IR) is equal to crop consumptive use minus effective precipitation. The IR data is derived from the Caldwell weather station data located at:
<http://www.kimberly.uidaho.edu/water/appndxet/index.shtml>

Based on these crops, the IWR is approximately 190 million gallons for 133 acres. Wastewater application volume will not be a limiting parameter. The majority of the irrigation water requirements will be provided by supplemental irrigation water drawn from the Ridenbaugh canal controlled by the Nampa-Meridian Irrigation District.

4.2.4 Non-growing Season Hydraulic Loading Rates

The NGS hydraulic loading rate is determined by the following equation:

$$HLR_{ngs} = [AWC + E - PPT_{ngs}]$$

where: HLR_{ngs} is the hydraulic loading rate for the non-growing season

AWC is the available water capacity of the soil

E is the estimated evapotranspiration during the non-growing season

PPT_{ngs} is the average precipitation for the non-growing season

McMahon 2005 calculated an NGS loading rate of 6.71 inches for this site. The data is summarized in Table 10.

Table 10. Non-growing Season Hydraulic Loading Rates

Acres	Soil AWC, inches	E _{NGS} , inches	PPT _{NGS} , inches	HLR _{NGS} , inches	HLR _{NGS} , MG/ year
133.1	9.72	2.8	5.81	6.71	25.5

A NGS hydraulic limit of 6.71 inches will be specified in the renewal permit, although it will not be a limiting parameter. For comparison purposes, if the entire volume of wastewater in Table 8 (13.86 million gallons) was applied during the NGS on 133 acres, the hydraulic loading rate would be 3.84 inches. This is the approximate volume of wastewater that can be applied before reaching the proposed permit limit for the NVDS loading rate.

4.2.5 Loading Rate Analysis

As discussed in section 4.2.2, staff recommends NVDS loading rates be limited to crop uptake of NVDS to prevent TDS from reaching ground water. The objective is to improve ground water quality relative to TDS and chloride.

At NVDS loading rates equal to crop ash uptake, the projected nitrogen, phosphorus, and COD loading rates are 21 lbs N/acre-year, 4 lbs P/acre-year, and 0.7 lb COD/acre-day. These loading rates should prevent any further degradation of ground water and reduce soil phosphorus levels over time.

4.3 Soils

The soil types from the Canyon County soil survey reports two types of soils present at this site: Power-Purdam silt loam and Purdam silt loam. The survey reports these soils units are used mainly for irrigated agriculture including alfalfa, small grains, corn, sugar beets, or pasture.

The soil chemical properties are summarized in Attachment 4. The site has elevated soil phosphorus levels. Addressing the soil phosphorus levels is discussed in the section 4.2.2.

4.4 Ground Water

Ground water has been impacted by land application activities. Attachment 5 contains ground water monitoring results since 1997. Attachment 6, taken from the 2005 annual report, is a ground water flow contour map for measurements taken in October 2005. Ground water flows west northwest.

The on-site and downgradient ground water has elevated chloride and TDS levels due to land application activity. The magnitude of chloride and TDS ground water impacts are shown in Table 11.

Table 11. Ground Water Chloride and TDS Concentrations, Average of 2005 Results

Monitoring Well	Location	Chloride, mg/l	TDS, mg/l
MW-5	Upgradient	18.1	468
MW-4	On-site, on SU-009103	516	1,430
MW-2	On-site, on SU-009102	818	2,170
MW-8	Downgradient	256	1,220

Ground water phosphorus data is only available for 1999 (See Table 5). All of the 1999 results were

above the 0.1 mg/l level which is the level of concern if ground water is discharging to surface water.

Ground water TDS concerns will be addressed by setting a permit limit restricting the NVDS loading rates to approximately crop uptake of NVDS. Crop uptake of NVDS is approximated by the ash content of the harvested crop.

Concerns regarding ground water phosphorus discharging to surface water via shallow ground water will be addressed by the low projected phosphorus loading rates to be allowed in the new permit.

4.5 Surface Water

The Perkins Drain runs generally along the northern edge of the land application area. The Rachel Drain runs generally along the western border of the land application area. Surface water in this area is generally tributary to the Boise River.

4.6 Site Management

As discussed in section 3 of this analysis, wastewater will not be land applied at the plant site under normal operations. Treated wastewater will normally be discharged to the Purdam Gulch Drain under EPA NPDES permit ID-002803-7. Sorrento Lactalis submitted this renewal application to reserve the ability to land apply at the plant site during wastewater treatment plant upsets, lengthy power outages, or in the event unusually high strength wastewater is generated at the plant.

4.6.1 Buffer Zones

Wastewater is land applied using gravity irrigation methods, from concrete ditches and siphon tubes or gated pipe. Tail water from the fields is contained in a collection system and routed back to the into the irrigation system.

An earlier permit renewal application prepared by Scanlan Engineering, dated February 2000³ (Scanlan 2000) provided justification for using the existing buffer zones of 125 feet or more to homes and 0 feet to public access areas. The guideline buffer zones for this site are 300 feet or more to homes and 0 feet to public access areas if the area is considered a rural or industrial area and 50 feet if the area is considered residential. There is a subdivision located approximately 800 feet north of the site. Land use to the west, south, and east is primarily agricultural.

Based on the limited amount of land application proposed, surface irrigation methods, and low strength wastewater to be applied, staff recommends approval of the existing buffer zones currently being used.

The recommended buffer zone to private and public domestic wells is 500 feet and 1,000 feet respectively. Ground water at this site flows to the west northwest (see Attachment 6). The McMahon 2005 application did not provide an update of the well location acceptability analysis. The most recent well location acceptability analysis was provided in Scanlan 2000. Attachment 7, taken from Scanlan 2000, shows the location of wells around the site. Staff recommends including a compliance activity to provide an updated well location survey in the renewal permit for wells that may have been installed since the last update.

3 Application for Wastewater Land Application Permit, February 2000 Draft, Scanlan Engineering (Scanlan 2000)

4.6.2 Crop Management

Historically, a grass crop has been grown at this site. McMahon 2005 states the plan is to continue growing a grass crop in the future.

4.6.3 Waste Solids Management

Biosolids from the wastewater treatment plant are land applied at a different DEQ-permitted location. McMahon 2005 does not propose application of biosolids at the plant site.

The tailwater system includes a sediment settling pond prior to routing water back into the irrigation system. Sediment/silt removed from the settling pond is land applied back on to the fields. Loading rates from this silt are already accounted for in wastewater that is land applied.

4.6.4 Wastewater Treatment Pond Closure

The two wastewater treatment ponds located west of field 1 have been replaced by the new wastewater treatment plant installed in 2005. Staff recommends a compliance activity be included in the permit to address closure of these ponds.

4.6.5 Tailwater Ponds

Field's 1, 2, 3, 4, 6, and 7 have a collection system and pond to contain sediment and tailwater water from these fields. Water collected in the system is returned to the irrigation system with a pumping system.

Field 5 tailwater is collected in a separate small pond and is returned to the treatment plant through a gravity pipeline.

The tail water ponds do not have synthetic liners and no seepage rate tests have been completed. McMahon 2005 requests the continued use of the existing tail water collection systems because tailwater will be low strength water in future operations. Staff recommends allowing the existing irrigation system to be used for land application of the low strength wastewater consisting of off-grade final effluent.

Staff recommends any emergency land application of raw or high strength wastewater in the future not result in any tail water reaching the tail water ponds. Staff recommends the permit contain a compliance activity to describe procedures for handling emergency land application of any raw or high strength wastewater at the plant site. This compliance activity shall address:

- Prevention of any tail water generation;
- Odor management; and
- Vector control.

4.7 Compliance Activities

Staff recommends compliance activities to address the following areas:

1. An updated well location acceptability analysis to supplement the February 2000 analysis.
2. Closure of the wastewater treatment ponds.
3. High strength wastewater application management plan including procedures to prevent tail water

generation and address odor and vector control.

5.0 RECOMMENDATION

DEQ staff recommends that the attached land application draft renewal permit be issued. The draft renewal permit contains loading rate limits to address ground water contamination and concerns with phosphorus contained in shallow ground water reaching surface water.

Monitoring and reporting requirements to evaluate system performance and to determine permit compliance have been specified. Compliance activities, as recommended in the staff analysis, are incorporated into Section E of the permit.

6.0 ATTACHMENTS

[Figure 2](#), *Vicinity Map* from McMahon 2005

[Figure 3](#), *Field Identification and Monitor Well Locations* from McMahon 2005

Attachment 1, 7.36 MG Wastewater to Land Application Post-WWTP Startup

Attachment 2, 90.36 MG Wastewater to Land Application Post-WWTP Startup

Attachment 3, 13.86 MG Wastewater to Land Application Post-WWTP Startup

Attachment 4, Soils Data from Annual Reports

Attachment 5, Ground Water Data from Annual Reports

Attachment 6, Ground Water Contour Map from the 2005 Annual Report

Attachment 7, Well Location Map from Scanlan 2000

Note:

Attachments are available for viewing at DEQ Boise Regional Office, 1445 N. Orchard, Boise.